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Progress towards the Fielding of Ignition Targets on NIF

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Disclaimer

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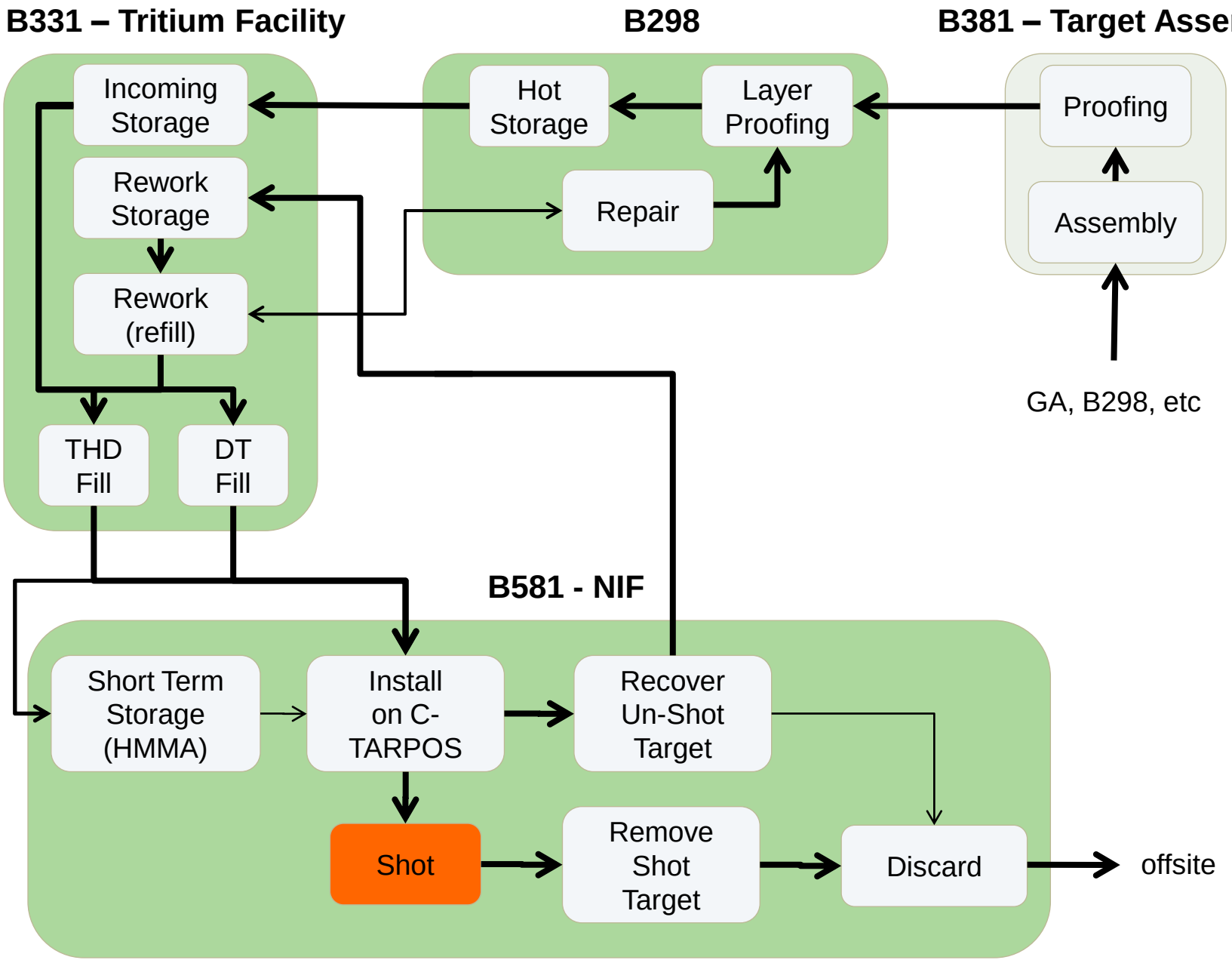
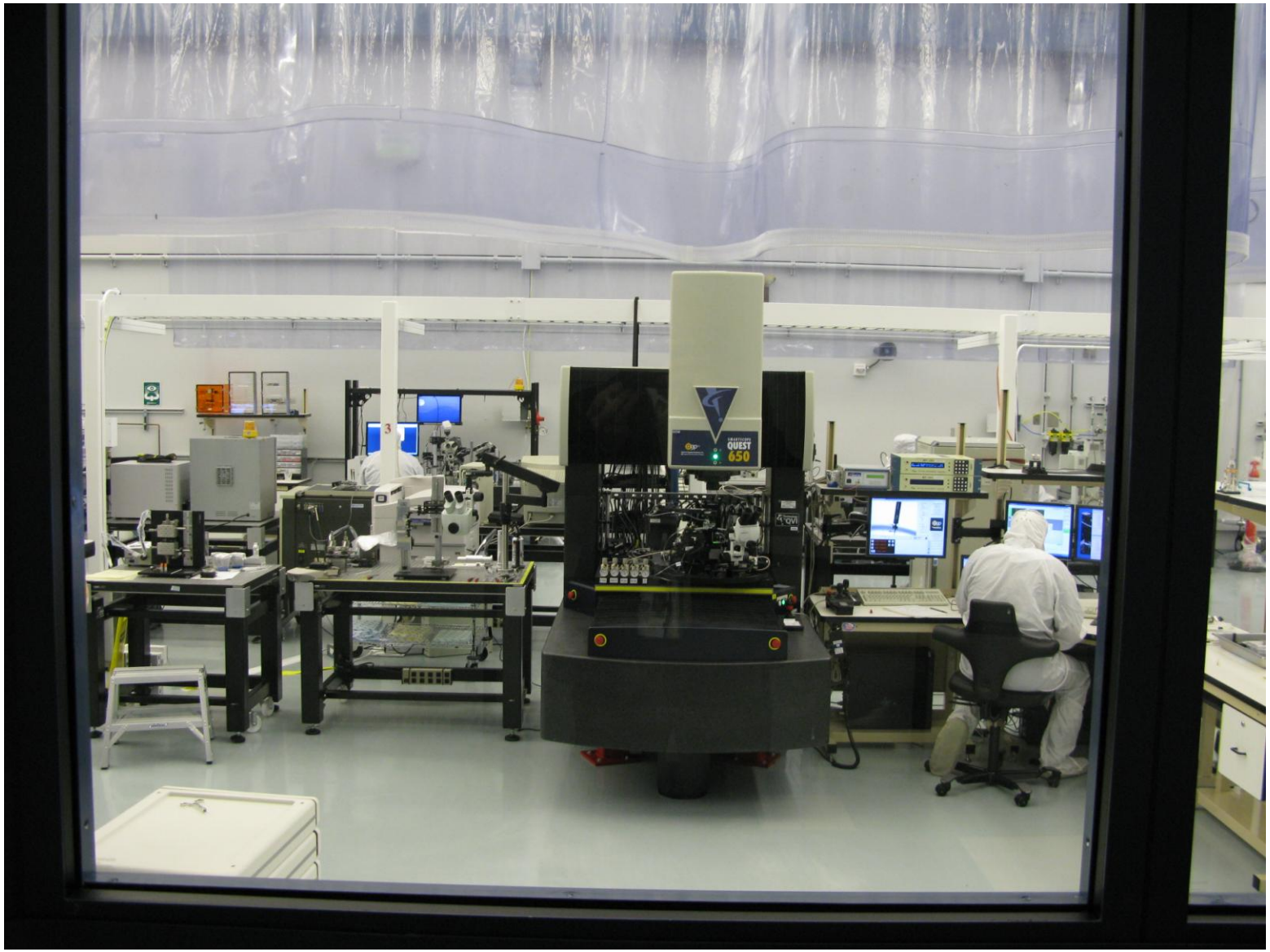
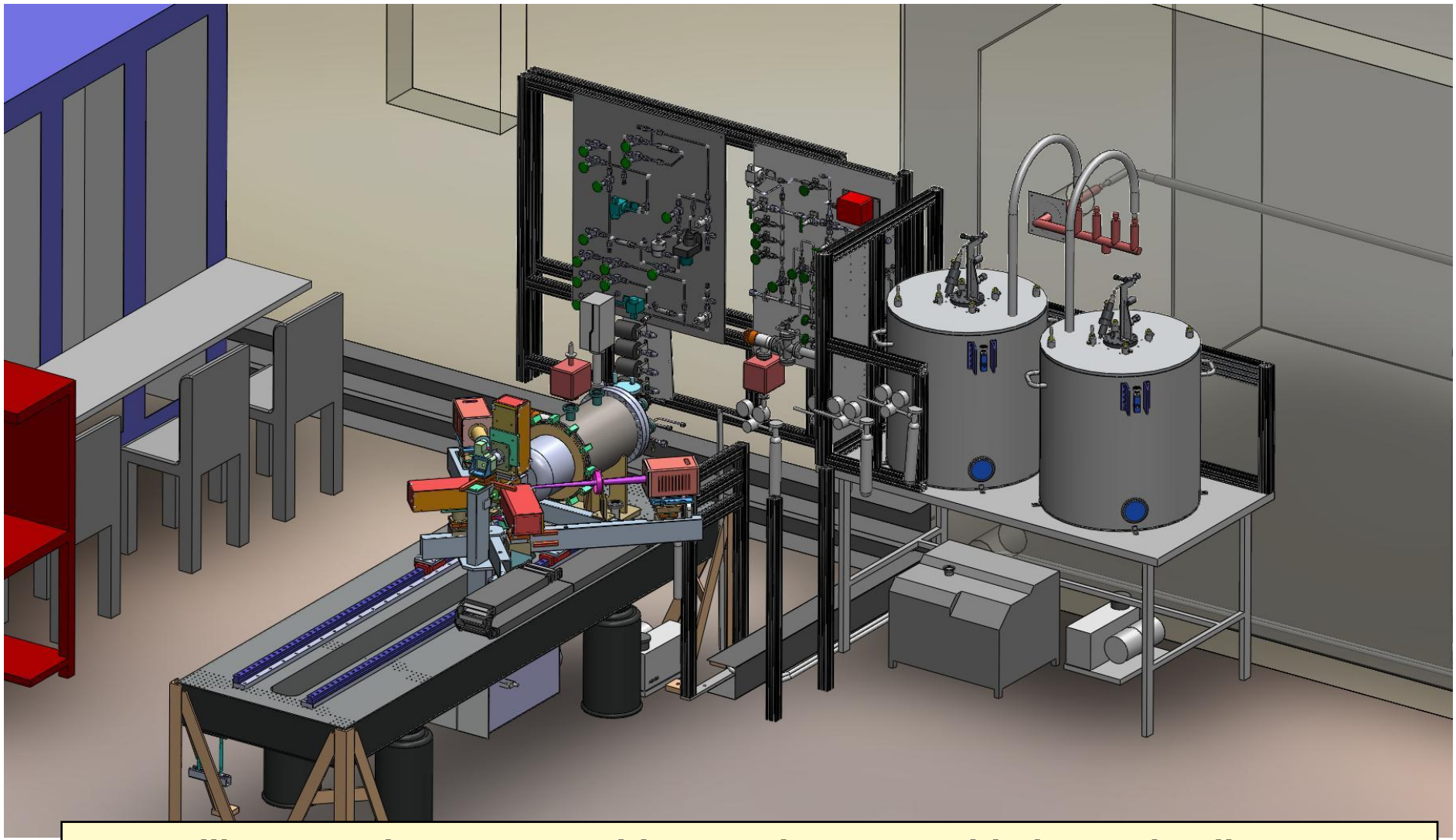
Fielding of Ignition targets will require the integrated resources of multiple facilities



LLNL final assembly (B381)

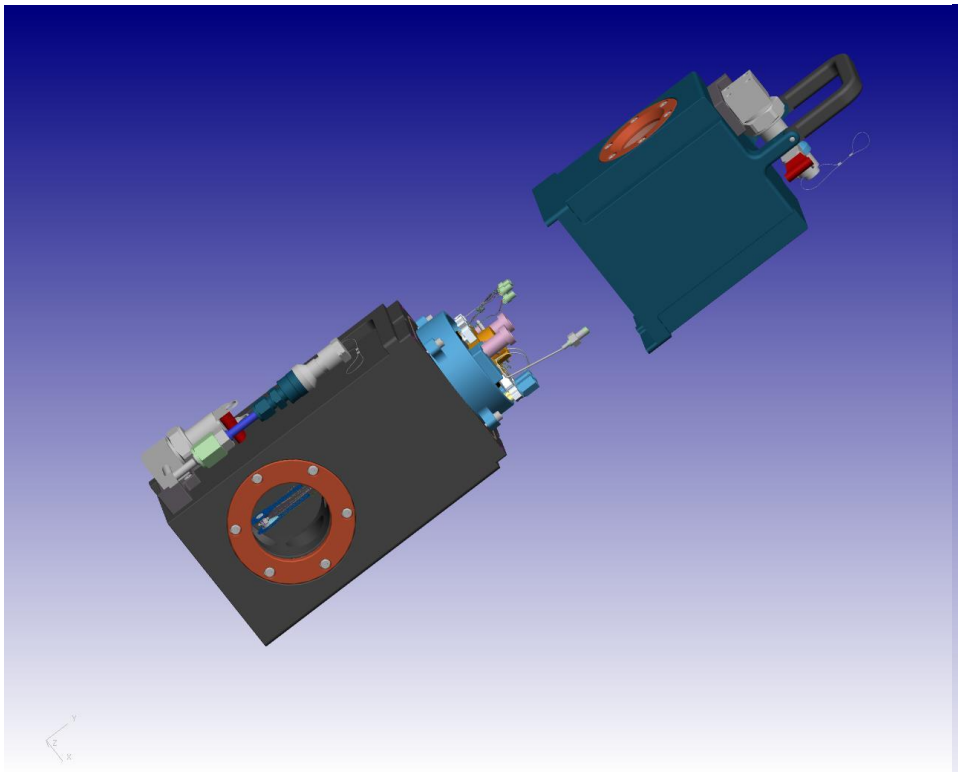


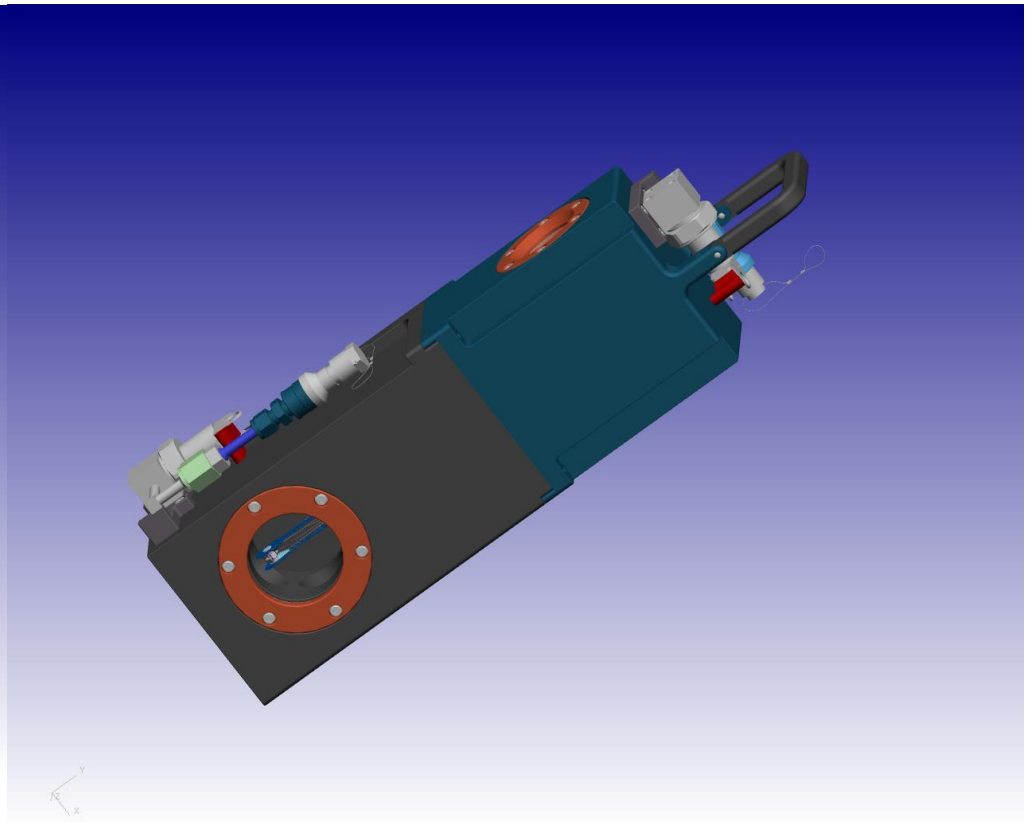
Ignition target proofing station in B298



ITPS will ensure that we area able to make acceptable layers in all targets set to NIF and will collect data used to minimize the fielding time in NIF

Target transporter





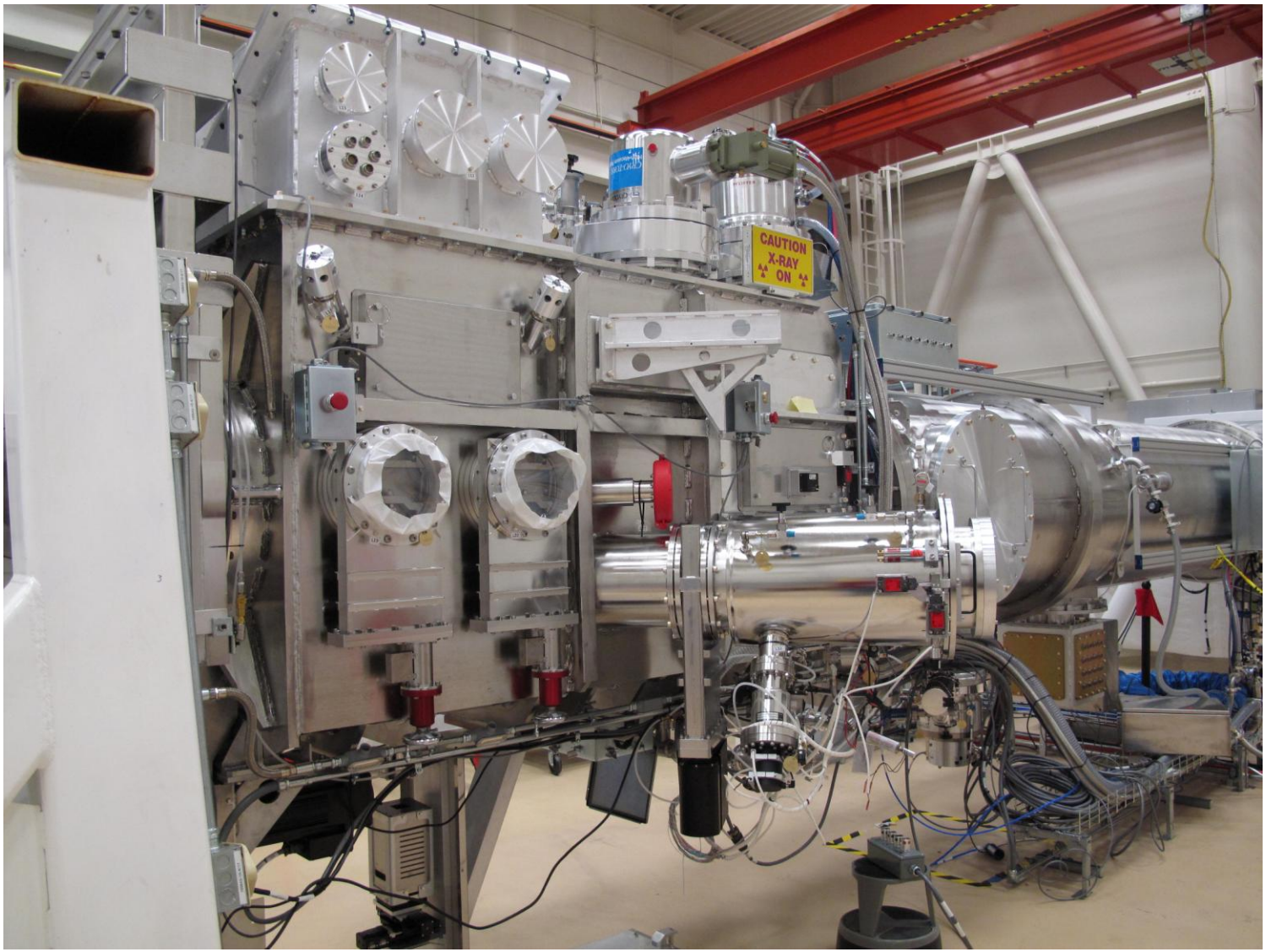
- **Sealed evacuated container**
  - **Minimizes diffusion into capsule**
  - **Minimizes exposure of tents to radiation**

Tritium process station in B331

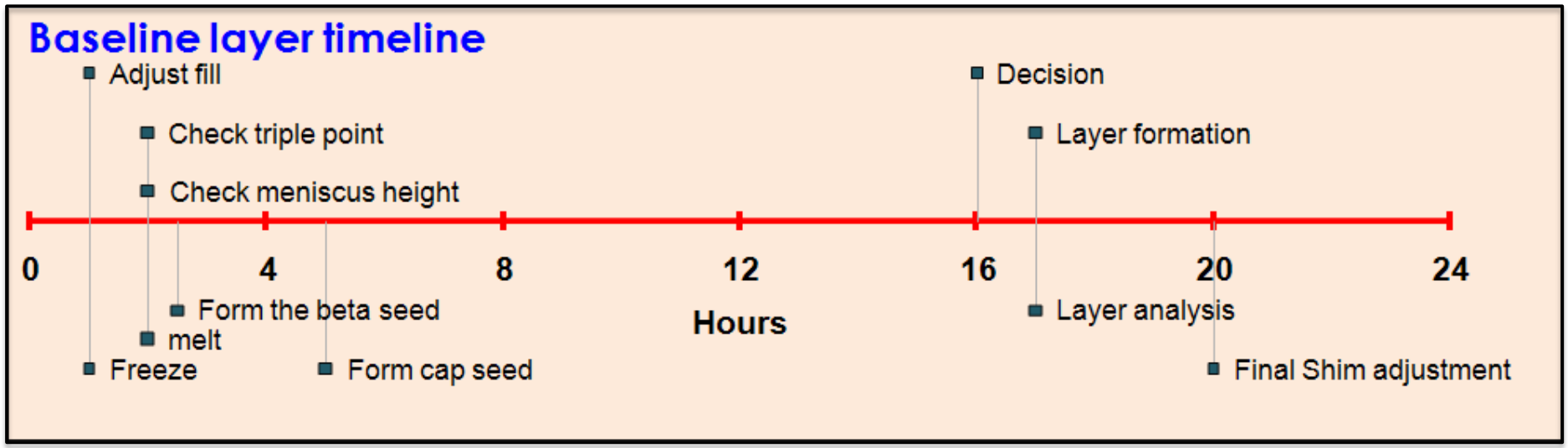
- LLNL tritium facility now has two systems operating to support NIF
  - Tritium Science Station (TSS) will provide arbitrary mixtures of H,D, and T.
  - Tritium Process Station (TPS) will provide low H and He fills of DT

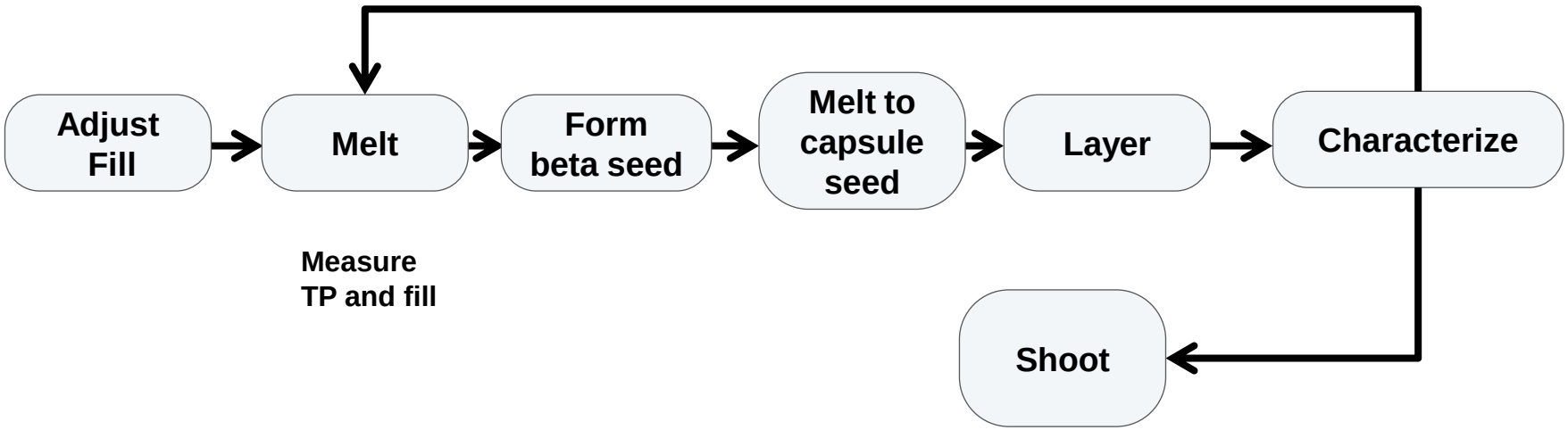
Cryo Tarpos in B490

Cryo-tarpos

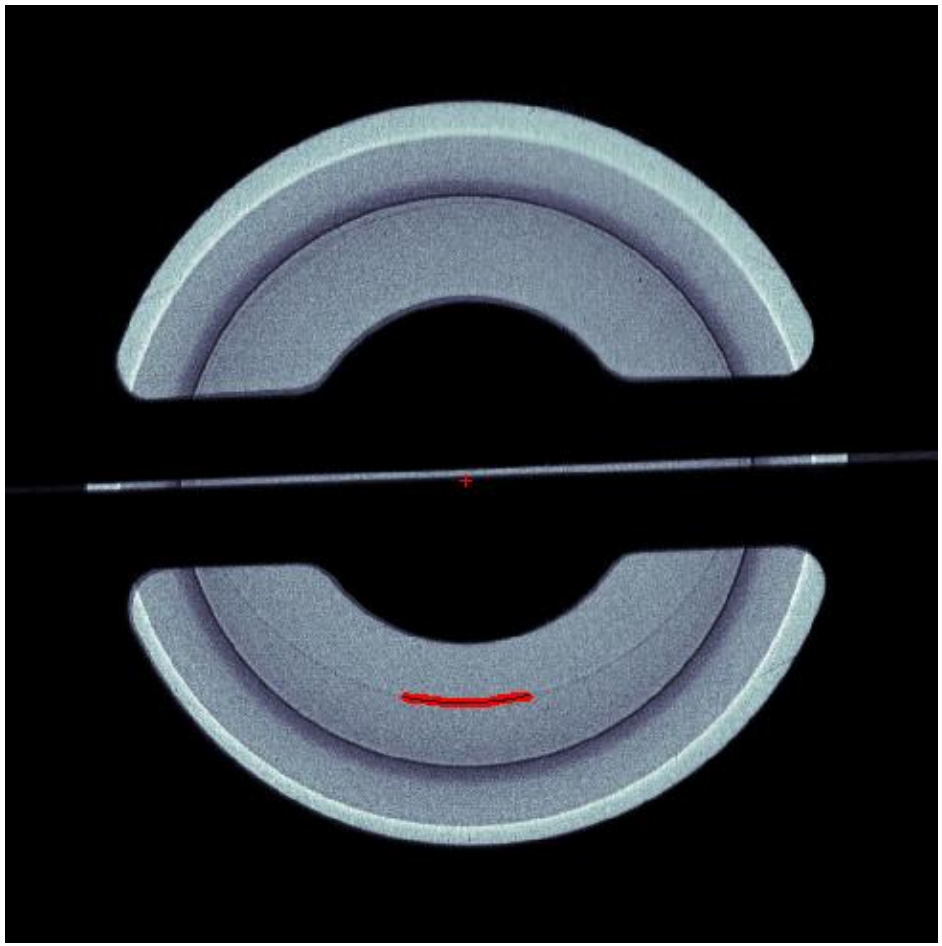


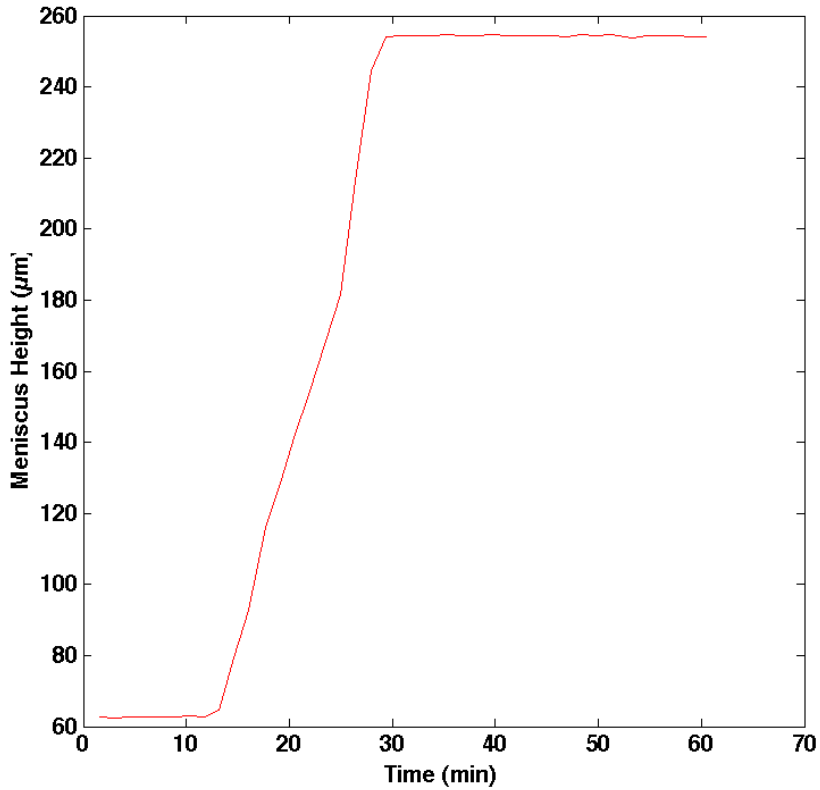
The layer formation timeline



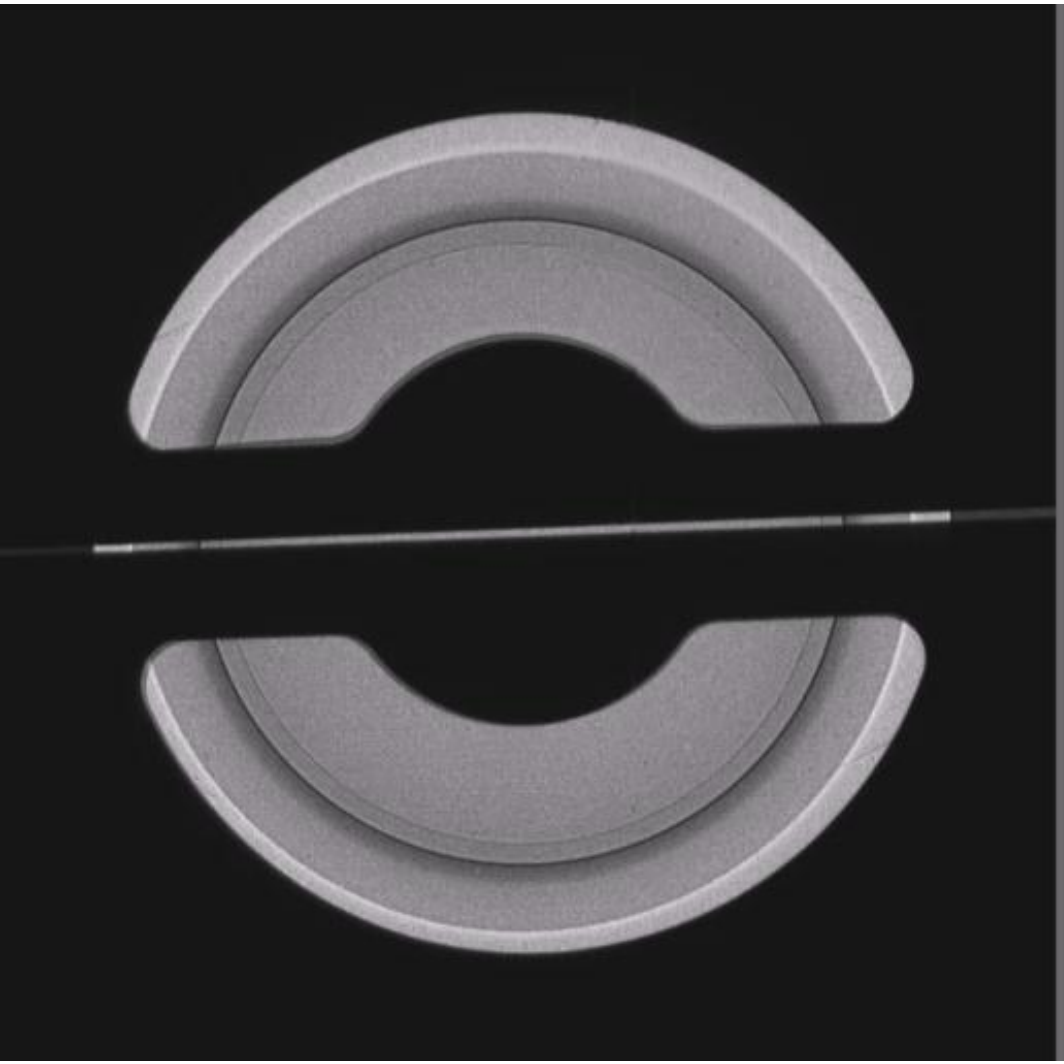


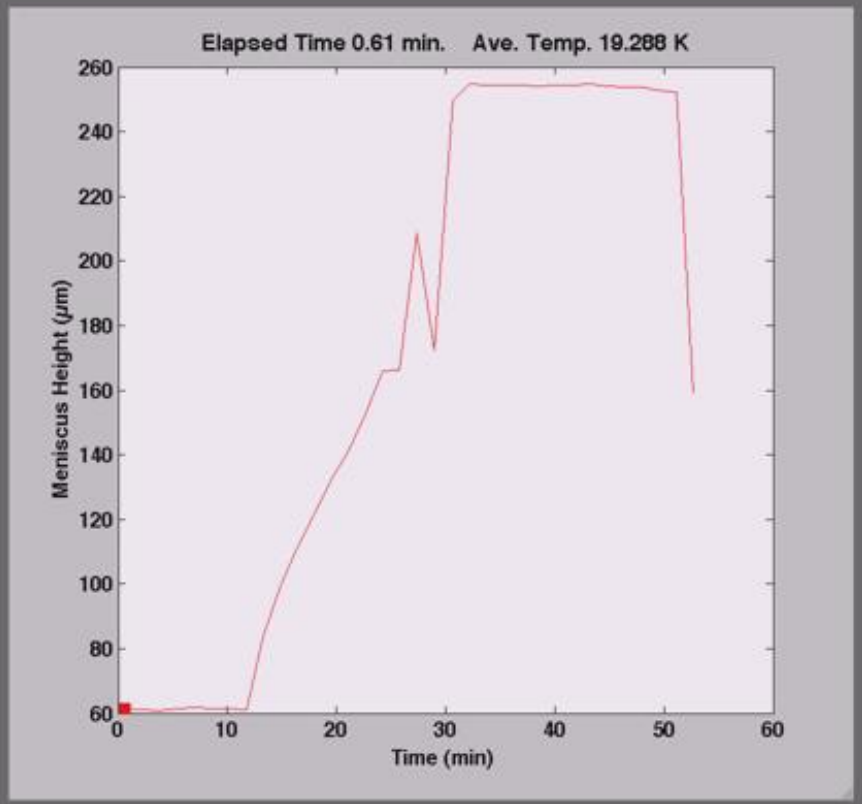
Measurement of the meniscus height is used to automate several parts of this process





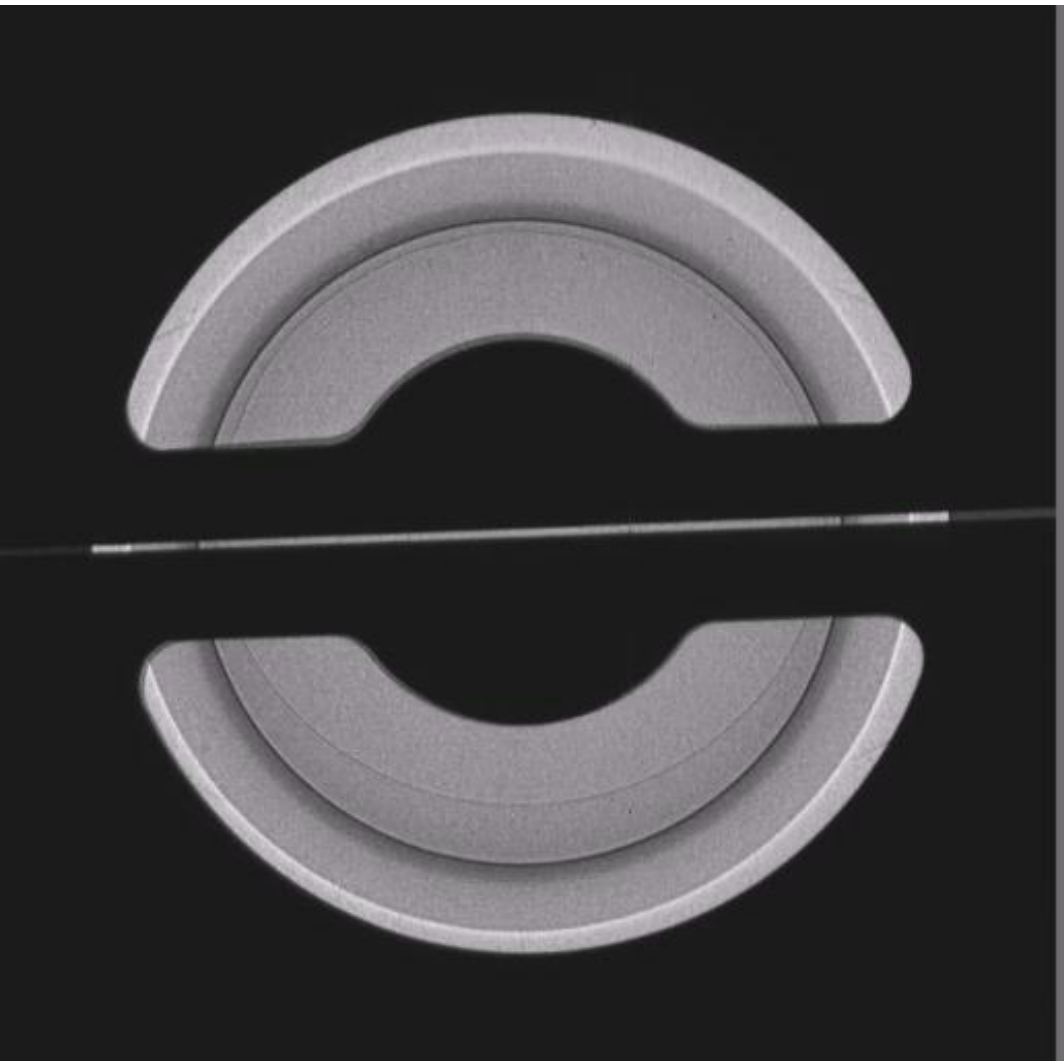
Melt and Beta seed formation

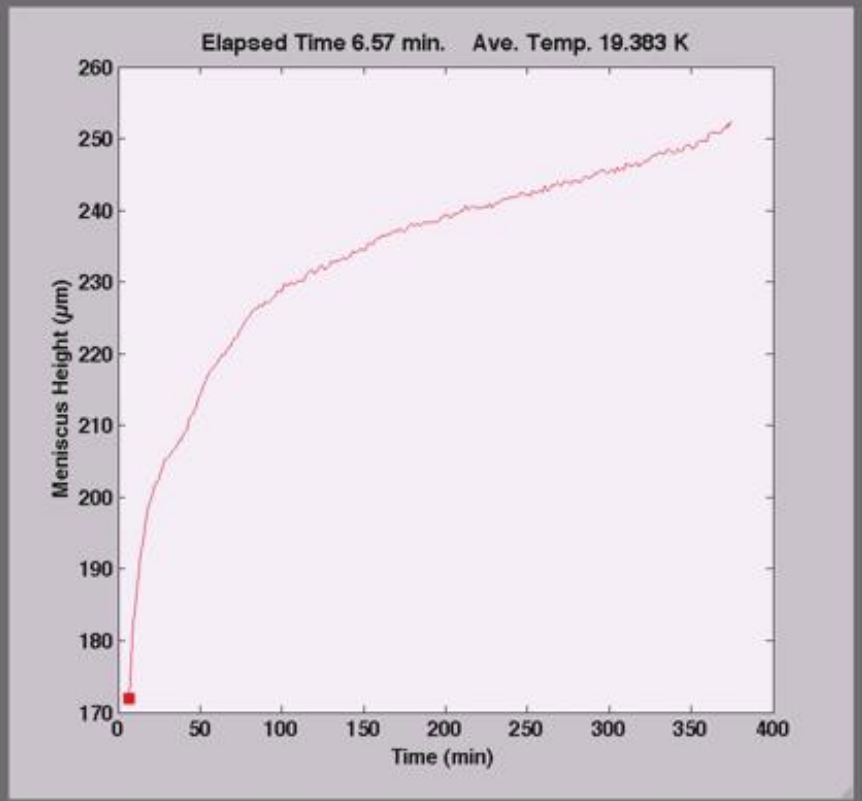




See B. Kozioziemski poster for details of beta phase

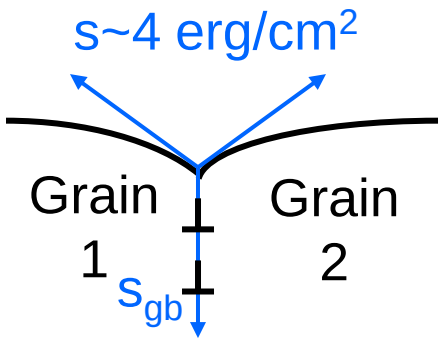
Capsule seed formation

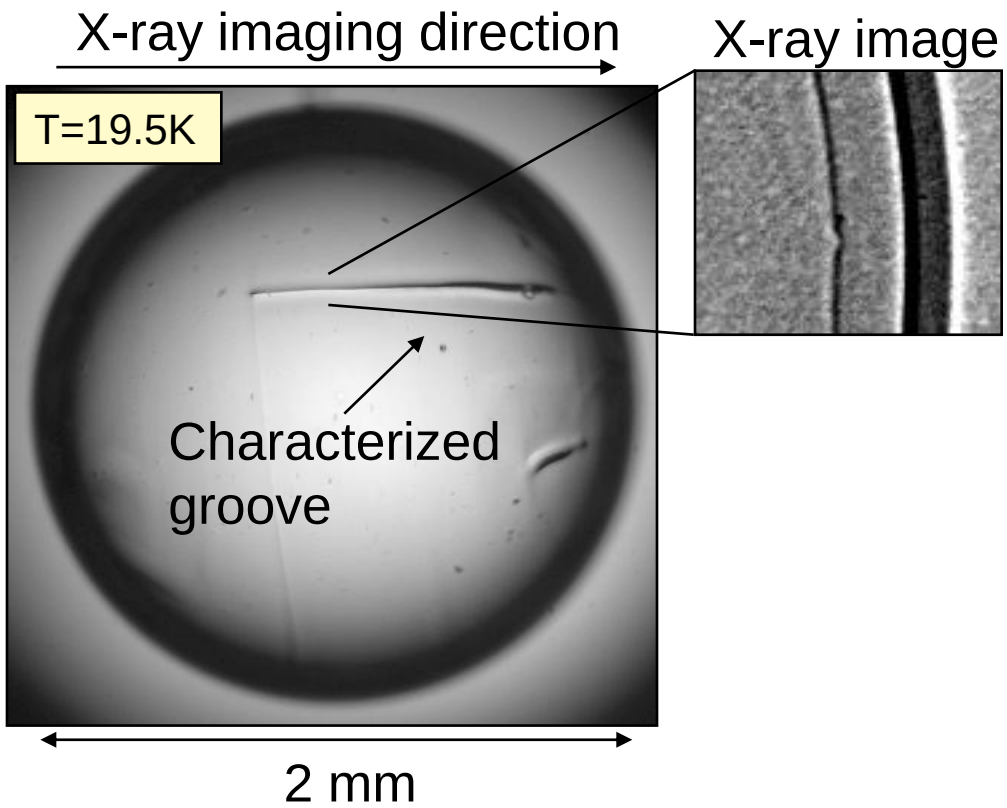


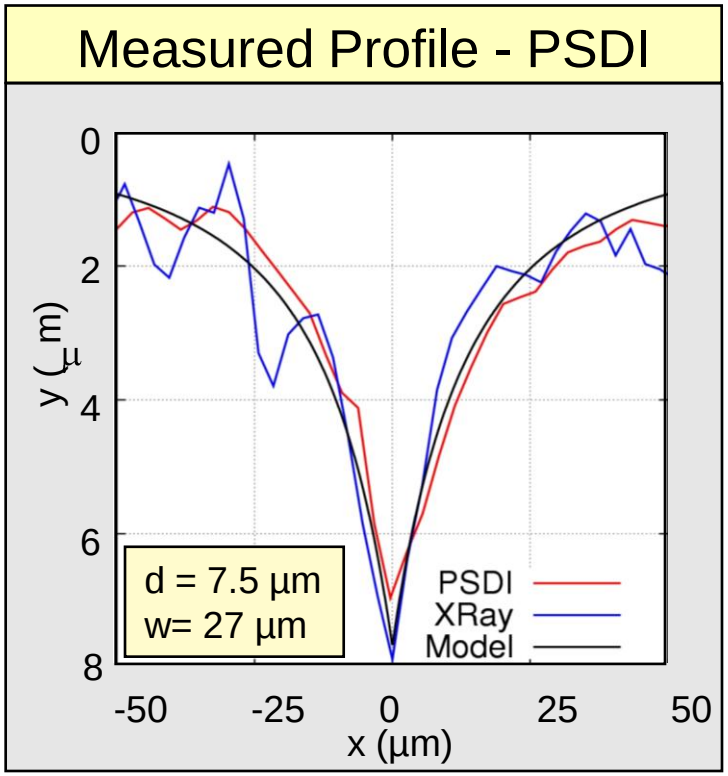


Local defects are vapor-etched grooves formed at small-angle grain-boundaries

- Groove profile compared to model
  - y(x) = d/(1+|x|/w)^2
    d = groove depth
    w = 1/2 width

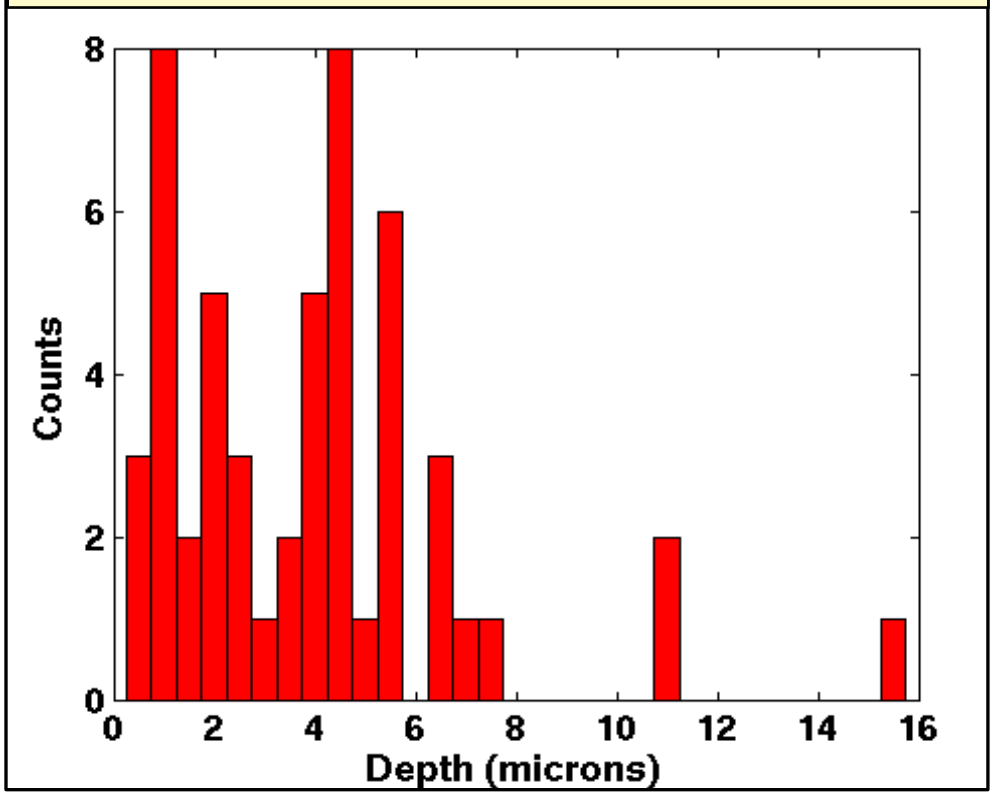




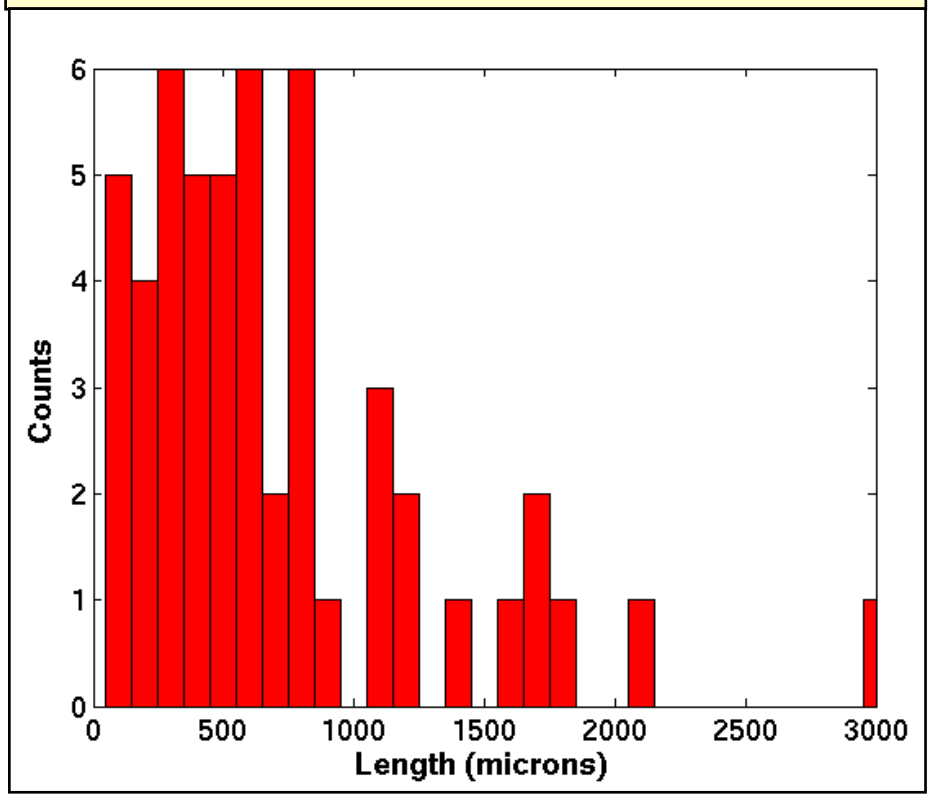


The distribution of groove lengths, depths, and widths has been characterized by interferometry

Depth

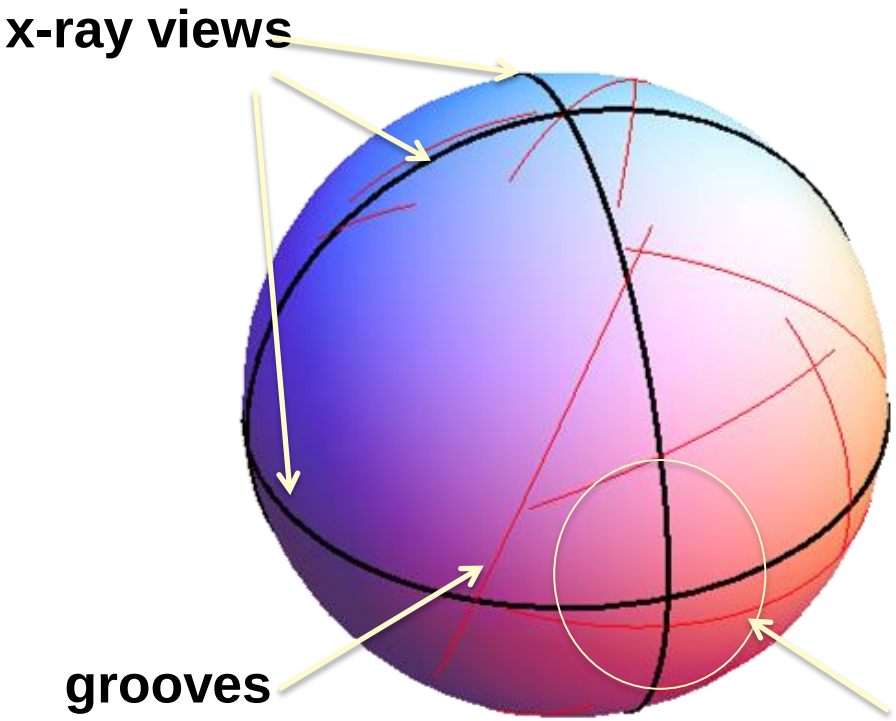


Length



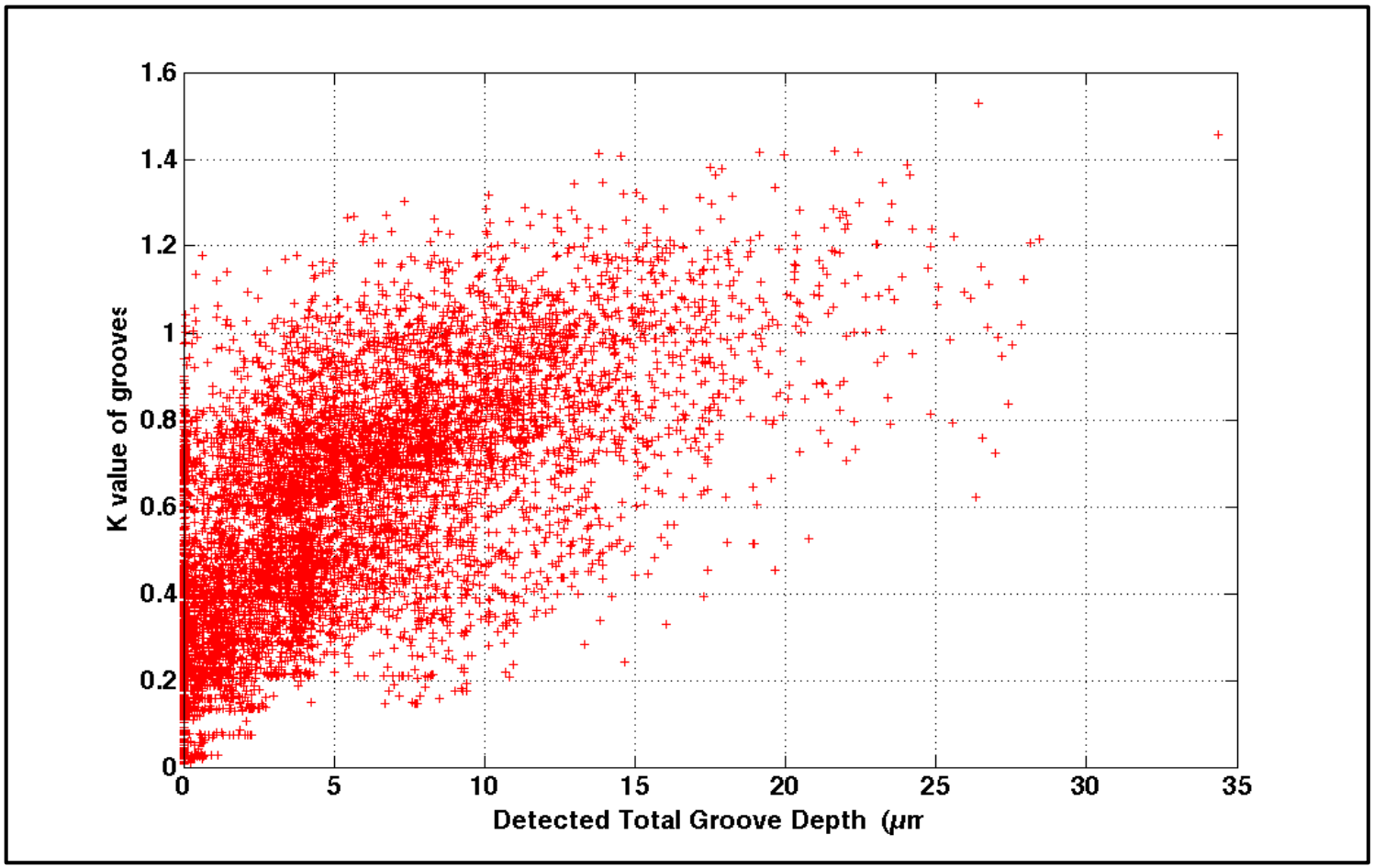
Grooves

- **Estimation of the probability that a given layer meets the K spec and the maximum groove area spec will rely on a statistical evaluation of the probability of a given population of grooves producing the x-ray images seen with that layer.**

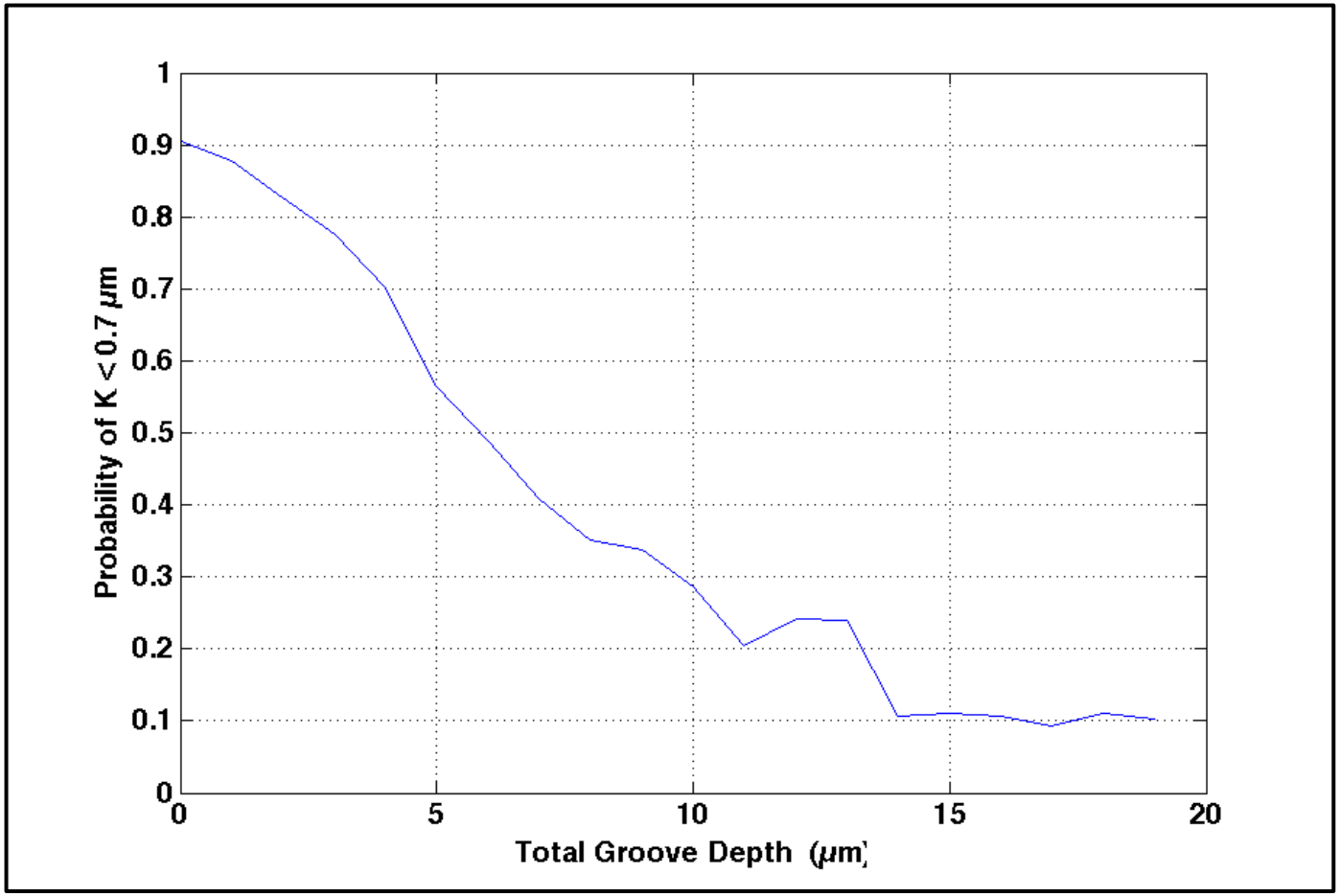


- **Grooves from a population characterized by PSDI are randomly place on a sphere and the total depth detected in the three x-ray views is calculated along with the actual K**

Calculation using the existing set of grooves from alpha seeded layers



Probability of success



About 40 % of our current layer have > 70 % probability of meeting spec
See Oral 17 – J. Sater: Statistics of DT Layer Quality in NIF Targets

Summary

- All of the infrastructure need to field cryogenic layered targets on NIF is nearing completion
  - Target Product and Proofing
  - Tritium Systems
  - Cryogenic Target Positioner
- A baseline layering method has been defined and is in testing
- Results indicate that a significant fraction of layers will meet all of the ignition requirements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